Space Weather Forecast

Issued on Tuesday, 26 December 2023 at 12:58 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Risk of G1 Minor or perhaps G2 Moderate geomagnetic storm from midweek UTC. Now-reduced chance of further R1 Minor Radio Blackouts.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low over the past 24 hours, with only minor Common-class flares observed. The largest of these events was at 26/0501UTC, originating from narrowly ahead of the visible leading spot of a sunspot region in the southwest - this has been and remains the main source of front-side activity through the Christmas period.

There are currently eight sunspot regions on the facing side, with a new group emerging in the southeast although this appears to be small and stable at present. The main change in the period was the emergence of minor spots surrounding a region near the solar meridian and its developing magnetic bipolarity, with other regions apparently stable or in decay.

In a very different vein to the previous 24 hours, no new Earth-directed Coronal Mass Ejections (CMEs) were seen in imagery, although numerous potential sources remain in the form of many 'filaments' (arcs of plasma).

Solar Wind / Geomagnetic Activity: Solar winds were slightly elevated throughout the period. The reason for this remains uncertain, but is perhaps a marginal and weak fast wind, with an uncertain source.

The solar wind speed rose gradually over the 24 hours. The number of particles in the solar wind density fell slightly to background levels, while their magnetic field was generally unremarkable in scale and character. The net result of the above solar wind measures was for provisionally quiet geomagnetic activity throughout the period.

Energetic Particles / Solar Radiation: No solar radiation storms were observed, however proton flux was very slightly raised above resting background levels in the 24 hours, although well below Minor Solar Radiation Storm S1 (10pfu) and in fact even below 1pfu for the duration. The cause of this enhancement is not known, however given the very gradual rise and soft spectrum, it may be a far side or even eastern solar horizon event, perhaps even the long-period Moderate class flare from behind the eastern horizon on 24 December.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity is forecast, with a now slightly reduced chance of isolated Moderate-class X-ray flares.

Solar Wind / Geomagnetic Activity: There has been a glut of CMEs over the Christmas period, with the distilled result being of two possible glancing blows and one more assured hit. These

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events are likely to interact and as such there is lower than average confidence in the geomagnetic forecast, even though no coronal hole fast winds feature.

Geomagnetic activity will be most reliably quiet in the current UTC day. A pair of CME glancing blows are then expected on 27 and 28 December, with a third more direct hit also possible on 28 December. The possibility that this final CME arrives concurrently with the second glancing blow should give rise to a peak risk of Minor Geomagnetic Storm G1, and perhaps even Moderate G2 in the UTC day of 28 December, with a residual tail of effects perhaps continuing into 29 December.

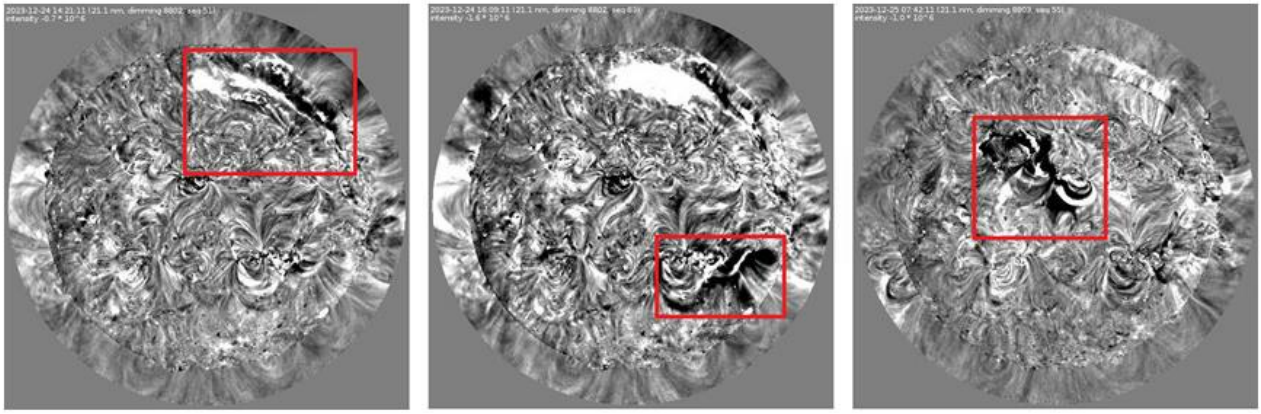

Figure 1: Time-integrated extreme UV imagery processed by SIDC ROB showing the three sources of CMEs due in the forecast period.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, but there is a daily slight chance of occurrence given any further notable flares.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	40	60	20
Strong	G3	No	1	1	5	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

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X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	25	25	25	25
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	5	5	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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